



# Center of Gravity

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**T**HE CONCEPT OF center of gravity (COG) is perhaps the most critical element of operational and strategic warfare. No plan for a campaign or major operation can be executed quickly and decisively without identifying enemy and friendly COGs and properly applying combat power to degrade, destroy, neutralize or protect them. However, despite the significance of this concept, misunderstanding and confusion surround what really constitutes a proper COG. Many theoreticians and practitioners also doubt the concept's practical usefulness for commanders and staffs planning and executing campaigns or major operations. Identifying a COG provides a locus toward which to direct all sources of power—combat forces and noncombat elements.<sup>1</sup>

Discerning the COG should optimally start with identifying and analyzing critical factors, both individually and collectively. Center of gravity is often confused with objectives or decisive points or critical vulnerabilities. However, these concepts differ greatly. Operational commanders and their staffs should fully know and understand the concept of critical factors and the analytical process used to identify the proper COG for both the enemy and friendly forces.

The term “critical factors” refers to both “critical strengths” and “critical weaknesses” of a military force or nonmilitary source of power. They exist at each level of war and can be concrete or abstract.<sup>2</sup> At the strategic and operational levels of war, tangible critical factors range from those purely geographic (geostrategic positions, bases of operations, lines of operations, lines of communication) to those purely military (armed forces, individual services or major forces). Abstract factors might involve the will to fight, coalition unity, public support or morale and discipline. Critical factors are relative and subject to change over time; therefore, commanders and staffs must constantly

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watch for effects on their plans and operations.

In generic terms, critical strengths are capabilities vital for accomplishing a given or assumed military objective. Critical weaknesses are those sources of power—combat or noncombat—whose deficiencies adversely affect the accomplishment of a given or assumed military objective. Some critical weaknesses can be exploited and become critical vulnerabilities—those critical weaknesses or their elements that are inadequate or highly susceptible to enemy actions (military, diplomatic, psychological). To complicate the matter, a critical strength might become a critical vulnerability if it lacks adequate protection or support and thereby becomes open to the enemy attack (command and control, communications and computers or logistics).

## What is a COG?<sup>3</sup>

Any sound plan for employing combat forces essentially hinges on properly determining a COG. Often the COG is understood as being one of the enemy's vulnerabilities. However, a COG is found among critical strengths—*never* critical weaknesses or critical vulnerabilities. Still, US forces, with the exception of the Army, erroneously believe that COGs are identical to critical vulnerabilities or even synonymous with the targets to be attacked and destroyed. Unlike an objective, decisive point, critical weakness or vulnerability, an enemy COG, particularly at the operational and tactical levels, can

physically endanger one's own COG. A COG is also often confused with the military objective to be accomplished. Experience clearly shows that focusing on the objective without identifying and attacking the enemy's COG will invariably result in unnecessary losses of personnel, materiel and

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time—even despite overwhelming combat power. Another error is to confuse a decisive point with the COG. Although closely related, decisive points do not relate to sources of strength but usually to critical weaknesses, which are relevant if they are open to attack and will facilitate an attack on the enemy COG. Once the COG is determined, decisive points are identified and targeted.<sup>4</sup> Yet, attacking enemy vulnerabilities will not cause the desired effect unless it influences the COG.<sup>5</sup>

Most theoreticians attribute the COG concept to the writings of Prussian war philosopher Carl von Clausewitz. While the concept itself is sound and extremely useful, its theoretical underpinnings are somewhat problematic.<sup>6</sup> Clausewitz might have thought in terms of “center of gravity” as we understand it today, but he used the uniquely German term *Schwerpunkt*—the “point of main decision.”<sup>7</sup> The meaning of that term has changed considerably since Clausewitzian days and today is used much more loosely and for many purposes.<sup>8</sup> In military terms, the *Schwerpunkt* designates a theater, area or place where the commander expects a decision.

The main factors in selecting a *Schwerpunkt* include the situation, terrain and commander's intent. In German theory and practice, commanders should “build up” a point of main decision (*Schwerpunkt-bildung*) within their areas of responsibility. When appropriate, a commander should designate a point of main decision for his subordinate commanders. A change in the situation requires a change or shift in the point of main decision (*Schwerpunkt-verlegung*).<sup>9</sup> The same term is often used for variety of military and nonmilitary situations to describe where the main focus of effort is or will be.

In generic terms, a COG is that source of leverage or massed strength—physical or moral—whose serious degradation, dislocation, neutralization or destruction will have the most decisive impact on the enemy's or one's own ability to accomplish a given military objective. A COG can be a source of leverage, as for example, in a hostage-taking situation. Then, the hostages themselves, not the terrorists or a state holding them, should be considered the enemy's COG. It is they who are the source of strength—or more accurately, leverage—for a terrorist group or a rogue state.

The concept of mass should not be taken too literally because what counts most is the massed effect, not whether combat power is physically concentrated in a certain area. Because of the long range, lethality and accuracy of air and naval weapons, COGs in air or naval warfare do not necessarily need to be massed in a specific area but may be dispersed throughout a large part of a given theater or area of operations. In contrast, a ground force's COG must usually be massed in a relatively small physical area. Yet, even in land warfare, increases in the speed and range of various platforms allow massing within a larger area of the theater than was possible in World War II.

**Composition.** A massed effect of power—military or nonmilitary—is the key ingredient for the emergence or existence of a COG at any level of war. The larger and the more diverse the source of power, the more potential COGs. Military sources of power clearly predominate at the operational and tactical levels, while nonmilitary ones are most strongly represented at the national and theater-strategic levels.

The most commonly understood form of military power, combat power, contains an inner core and an outer core. The inner core, where almost the entire “mass” is physically concentrated, encompasses firepower, maneuver and leadership. However, the inner core cannot properly function without other elements that provide support, protection and integration—grouped arbitrarily in the outer core of the COG. There reside critical weaknesses and vulnerabilities, which the opponent can exploit. Protection against such attacks includes air defense, close air support, fire support and operational security. Supporting elements, also called “sustainers” are intelligence and logistics.<sup>10</sup> The integration elements, also called “connectors,” link leadership with all other elements of combat power.

Any COG encompasses both physical and abstract elements. In land warfare, physical or tan-

gible COGs can range from an armored or mechanized battalion or regiment to the ground forces as a whole. In naval warfare, a COG can be a direct screen of a convoy, a surface strike group, a maritime action group, a carrier battle group (CVBG) or a major part of a surface fleet, for example. In air warfare, a COG can be that element of a force of combat aircraft having the most significant combat power, such as a fighter or bomber squadron in a fighter/bomber wing, the entire force of fighters in a ground-based air defense or bombers.

The abstract or intangible (sometimes called imponderable) elements of a COG at any level include military leadership, doctrine, morale and discipline. They are difficult to quantify and therefore cannot be estimated with any degree of certainty. The higher the level of war, the more intangible elements fall within the scope of a given COG. Hence, they range from leadership of a tactical-size force to such factors as national or alliance/coalition leadership and the national will to fight. In an alliance or coalition, the COG might consist of the community of interests or common desires that hold the members together.<sup>11</sup> In *Desert Storm* for example, the Iraqis saw the Coalition's cohesion as an intangible element of the strategic COG, while the coalition viewed Saddam Hussein and his inner circle in an analogous role. However, there are instances when the strategic COG can be composed almost entirely of physical elements. This situation can occur in an immature theater of operations that lacks the population base and economic infrastructure to generate intangible elements. During the Solomons Campaign in 1942-43, Allied planners considered the Japanese naval base at Rabaul (New Britain) and the string of airfields in its vicinity as just such a strategic COG.

COGs at the operational and tactical levels of war are almost invariably the mass of the enemy force with the highest mobility and combat power. For example, the operational COGs for both the Allies and the Axis in the North African Campaign, 1940-43, were armored forces. Specifically, Germany's operational COG was not the entire *Panzergruppe Afrika* led by Field Marshal Erwin Rommel, but its *Afrika Korps* (15th and 21st Panzer divisions and the *Afrika Division*—later redesignated as 90th Light Division).<sup>12</sup> For the Germans, the Allied operational COG in the British counter-offensive in November 1941 (Operation *Crusader*) was the 1st and 7th Armored divisions with the additional armored brigades.<sup>13</sup>

In general war, intangible COG elements are usually represented only at the national and theater-

Terrorist-sponsored press conference with hostages, Beirut, Lebanon, June 1985.



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strategic levels; in a low-intensity conflict they can be found at the tactical level. Rarely in a counterinsurgency would the antigovernment forces mass to constitute a tangible operational COG. In counterinsurgency warfare, the rebel leadership on one side and government legitimacy and public opinion on the other are most likely to be strategic COGs, while each rebel group in the countryside would constitute a potential tactical COG. For example, during the insurgency in El Salvador in the 1980s, the strategic COG for the rebel coalition was the legitimacy of the government itself.<sup>14</sup> In Somalia, the United States erred by becoming involved where its vital interests were not at stake, but the very survival of the Somalian clan leader Mohammed Farrah Aideed was. This dangerously asymmetrical situation allowed Aideed to attack the

US strategic COG indirectly. He challenged the national will to fight by exploiting a US critical vulnerability—aversion to suffering casualties. With no vital interest at stake, the United States could not protect and sustain popular and political support, while Aided's desire for independent power could be sustained indefinitely.<sup>15</sup>

### **COG Relationships**

**COG and Levels of War.** In generic terms, a COG exists for a given tactical, operational and strategic military objective to be accomplished. Thus, COGs potentially exist at each level of war. The COG concept becomes more complicated at the

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tactical level, because different and multiple COGs exist at any given time for forces fighting on the ground, in the air and at sea. Because of the potential for many lower-level COGs, the concept's utility at the tactical level is somewhat suspect. Arguably, the concept is more useful for planning at the operational and strategic levels, where their number is small and the effects of improper or untimely identification can be severe.

**COG and Objective.** Centers of gravity closely relate to objectives; they influence each other and must be in consonance. The operational COGs are linked to both strategic and operational objectives; operational goals and COGs establish the foundation for the selection of tactical objectives and their related COGs. If this inherent linkage to the strategic aim is to dominate the employment of forces in the planning process, operational and tactical considerations begin to determine strategy.<sup>16</sup>

Neutralizing, seriously degrading or defeating a COG at a lower level of war weakens the COG at the next higher level. Defeats in the field usually erode the enemy's will to fight. For example, destruction or neutralization of the Iraqi *Republican Guards* severely weakened both tangible and intangible elements of the Iraqi strategic COG. Likewise, successive defeats of the enemy's tactical COGs will

degrade his operational COG, and by neutralizing or destroying the latter, the ultimate result will be the defeat of his strategic COG.

Any change of the objective at the higher level should invariably lead to the change of the corresponding COG. Accomplishing a military objective at one level of war will invariably affect military objectives and COGs at other levels, and rapidly changing aims or operational objectives can even cause a loss of focus on the COG. The US defense of the Philippines in December 1941 is such an example. *War Plan Orange* projected a six-month defense to delay the Japanese, followed by a withdrawal to Baatan. A potential operational COG was the Japanese invasion force (with ground, air and naval components); however, the focus should have been on the Japanese ground forces once they landed. The fall 1941 buildup of US forces in the Philippines led both General Douglas MacArthur and planners in Washington, DC, to change the strategic aims: MacArthur was to abandon the citadel-type defenses and defend all the Philippine islands and the adjacent waters, cooperate with the Navy in raids against Japanese shipping, conduct air raids and assist in defense of the territories of the Associated Powers. These were considerably different aims from those initially assigned and required shifting the focus and method of US defenses.<sup>17</sup>

**Multiple COGs.** The number of COGs directly relates to the number of military objectives to be accomplished. Thus, the higher the level of war, the fewer COGs there will be. The higher the level of war, the more drastic the consequences of incorrectly identifying the enemy or friendly COG. At the national level, a single strategic COG usually exists. For instance, the World War II Axis Powers' will to fight and their military-economic strength can be considered their strategic COG. A large theater of war will usually contain several theater-strategic COGs, as was the case in the Pacific Ocean Area and Southwest Pacific Area in World War II. For each theater-strategic objective in these two theaters, a corresponding theater-strategic COG existed. And for each declared or undeclared theater of operations, a single theater-strategic COG existed. Thus, in southern Pacific Ocean areas, the Japanese stronghold at Rabaul on New Britain was the theater-strategic COG, while in an undeclared Philippine theater of operations, the theater-strategic COG comprised the Japanese ground, air and naval forces deployed in and around the Philippines.

The higher the level of war, the more fixed or un-

changeable a given COG is. For example, a strategic COG will change little or very slowly compared with the operational COG. It is a relatively fixed entity throughout the conflict and will change only if the leadership is changed or removed from power or a major part of the military or nonmilitary source of power drastically changes and thereby the enemy's force reemerges as a completely different entity.<sup>18</sup> For example, the strategic COG will shift or change its character if one or more members of an a coalition leave the war or change sides in a conflict.

### COGs and Force Employment

Normally, in a campaign, several operational COGs will exist, while in a major operation usually a single operational COG will exist. Regardless of their number, operational COGs in a campaign must be attacked to defeat or neutralize a given theater-strategic COG and attain corresponding operational objectives which cumulatively would accomplish the theater-strategic objective. Each major joint/combined operation in a campaign is usually directed at a specific operational COG. Normally, before launching a ground offensive in a land campaign, a number of operational objectives must be accomplished by air or naval forces.

The primary task of air forces is to obtain and maintain air superiority, which in turn, requires neutralizing or destroying enemy air defenses, specifically fighter aircraft strength—usually the operational COG. Naval forces must gain sea control in a maritime theater or part of it, and for them the enemy's operational COG will be the entire fleet or a major part of its striking forces. In the planned German campaign to invade Britain (*Seelöwe*), the *Luftwaffe* considered the Royal Air Force's Fighter Command as the operational center of gravity. Had the amphibious landing taken place as planned, the *Luftwaffe*'s focus would have shifted to the British mechanized forces defending the beaches or held in operational reserve. Likewise, in *Desert Storm*, the Iraqi fighter aircraft and ground-based air defenses were an operational COG for coalition's air forces. For the US and coalition naval forces, the Iraqi surface combatants had the same status.

Not all operational COGs are equally critical for success in a given campaign. Because the outcome of a land campaign hinges on the fate of ground forces, the most important operational COG is the one that comprises the most mobile and powerful enemy forces on the ground. The Iraqi *Re-*



An Iraqi air force command and control bunker targeted for destruction by an F-117 during the Gulf War.

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*publican Guards* represented the most important operational COG for all US and coalition forces in *Desert Storm*.

In any campaign, a single operational COG will exist for each successive operational objective. Afterward, the enemy will usually try to mass forces and a new operational COG forms in defense of the next operational objective. If US and coalition forces had, after a short pause, continued their advance into Iraq, a new operational COG would probably have been the remaining *Republican Guard* divisions and the other divisions deployed in the Basrah-Baghdad area. This force was organized into one army corps with seven divisions (three armored, one mechanized infantry and three infantry) with 786 tanks or about 37 percent of all the tanks in the Iraqi army.<sup>19</sup>

Centers of gravity are relative in time and space because they are always found where one's own combat power must be decisively employed. At the operational and tactical levels, both sides in a conflict will usually try to mass their forces and assets

in a given area and time to create decisive superiority. The operational commander and his staff should do everything possible to prevent the enemy from massing his forces, a task as important as defining the enemy's COG.<sup>20</sup>

**Absence of the COG.** If the enemy's COG is physically concentrated, as were the Iraqi *Republican Guards* in the Gulf War, it is relatively easy to

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identify. However, in some sectors, one's own and friendly forces will require a longer time to accomplish the ultimate military objective because the enemy's operational COG has not yet formed. Then, multiple tactical COGs must be defeated or neutralized over time to ultimately defeat the enemy's strategic COG. This situation arises in trade warfare (attack against the enemy's and protection of friendly shipping), and escort forces, as a whole, represent the enemy's operational COG. These forces never mass in a certain sea or ocean area but split to protect a given convoy or several convoys; the attacker must wear down the defender's COG over time.

A similar situation usually exists when fighting insurgents. Forces opposed to the government normally operate in small groups and use hit-and-run tactics. Since they normally do not operate in large formations, they seldom offer government forces an opportunity to destroy or neutralize them unless they make the mistake of prematurely operating in larger formations as the Yugoslav *Partisans* (guerrillas) did in late 1942. Communist leader Josip Broz-Tito changed tactics from small-scale attacks to large-scale operations by eight newly established "shock" divisions. The Germans took advantage of Tito's error, trapping and decimating his forces.<sup>21</sup>

Operational commanders should always be aware of opponents' ever-changing relative strengths and weaknesses. The mission can change from phase to phase of a major operation or campaign. The

introduction of advanced weapons or a major force into the theater might significantly shift relative capabilities.<sup>22</sup>

**Change of the COG.** The operational COG can shift to other types of force or change its character over time. A force different from that at the beginning of the hostilities or military action can emerge as the COG because of one's own success in combat. Higher-than-expected attrition, low morale and poor training and a general inability to regenerate combat power might also lead to a shift of the enemy's COG. Once a plan is executed, the situation must be closely monitored and reassessed to detect potential changes or shifts in the enemy COG.<sup>23</sup> For example, in the Leyte operation, US Third Fleet Commander, Admiral William F. Halsey, apparently thought that the most serious threat (the enemy's COG in modern understanding of the term) was posed by Vice Admiral Jisaburo Ozawa's *Main Body* (fast carrier force), not Vice Admiral Kurita's heavy ships of the *First Diversionary Attack Force*. One can argue that perhaps Halsey's obsessive desire for a decisive naval battle against the Japanese aircraft carriers, coupled with purposely vague orders from Admiral Nimitz, clouded his judgment. Nevertheless, Halsey apparently did not sufficiently account for the declining performance of Japanese pilots after the Battle of Midway. By October 1944, Japanese carriers did not represent as large a threat to US forces at Leyte as did Kurita's heavy surface force.

**Shift of the COG.** The enemy's COG can also shift from one type of force to another with phase changes in a major operation or campaign. This situation usually exists when phases change with the medium in which a force moves or combat is to take place (from sea to shore or from air to ground). In an amphibious landing operation, the defender's COG will likely be the attacker's naval task force (the surface ships with the highest combat power, usually the carrier attack force) assigned as operational cover and support. The amphibious task force at sea cannot threaten an enemy's operational COG on land, but the operational cover force can. Thus, for the defender the primary goal initially is to destroy or neutralize the attacker's operational cover as the Allies did at The Battle of Coral Sea in May 1942. However, once an amphibious force lands successfully, it becomes the COG.

In the Falklands/Malvinas conflict of 1982, the two British carrier forces constituted the proper operational COG prior to landing. Without these car-

riers, no landing could have been conducted by the British. While the loss of the transport *Atlantic Conveyor* on 25 May with its embarked equipment was a serious blow to the British effort, that ship was not a COG but a critical vulnerability. The troops and equipment could be replaced relatively quickly but not the aircraft carriers. After the landing, the British 3 Commando Brigade was the British operational COG. The Argentine operational COG was not surface forces but the land-based air power—specifically the *Exocet*-armed fighter-bombers. After the landing, the Argentine operational COG shifted to the troops defending Port Stanley.

Likewise, in a major airborne operation, such as was the German invasion of Crete (Operation *Merkur*) in May 1944 or the Allied airborne landing at Arnhem (Operation *Market Garden*) in September 1944, a similar shift of COG occurs as in amphibious landing operations. The escorting fighters represent an operational COG prior to the arrival at the landing zone; after the paratroops drop or the helicopters land, the airborne troops on the ground become the operational COG.

The concept of a COG is, besides objective, the

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most critical part of any military planning process. Both the objective and the corresponding COG must be properly determined. To confuse the objective with a COG is an error. However, to consider the enemy's vulnerability or decisive point to be a COG is a blunder. The higher the level of war, the more important it is to determine properly both the enemy and friendly COGs. Operational commanders and staffs should thoroughly understand the concept of critical factors and the analytical process to identify the proper COG for both the enemy's and friendly forces. No sound plan for a major operation or campaign can be drafted without focusing all efforts to protect friendly COGs and destroy or neutralize the enemy's. **MR**

## NOTES

1. Timothy J. Keppler, "The Center of Gravity Concept: A Knowledge Engineering Approach To Improved Understanding and Application" (Fort Leavenworth, KS: School of Advanced Military Studies, US Army Command and General Staff College, June 1995), 18-19.
2. The term "critical requirements"—essential conditions, resources or means for a critical capability to be fully operational—is also used in conjunction with the term critical factors; Joe Strange, *Centers of Gravity & Critical Vulnerabilities* (Quantico, VA: Marine Corps University Foundation, 2nd ed., 1996), ix.
3. "Center of gravity" is strictly defined as "that point in a thing around which its weight is evenly distributed or balanced; center of mass; point of equilibrium; Webster's New World Dictionary of the American Language, College edition (New York: The World Publishing Company, 1960), 237.
4. Bruce L. Kidder, *Center of Gravity: Dispelling the Myths* (Carlisle Barracks, PA: US Army War College, 1996), 12.
5. Phillip Kevin Giles and Thomas P. Galvin, *Center of Gravity: Determination, Analysis, and Application* (Carlisle Barracks: Center for Strategic Leadership, US Army War College, 31 January 1996), 19.
6. Carl von Clausewitz, *On War*, ed. and trans. by Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976, 8th printing, 1984), 595-96. In this seminal work, Clausewitz opined: "One must keep the dominant characteristics of both states in mind. Out of these characteristics a certain *Schwerpunkt*, the hub of all power and movement, on which everything depends. That is the point against which all our energies should be directed. It represents concentration of the enemy strength most vital to him in the accomplishment of his aim. If you could knock it out directly, it would be the most valuable target for your blows."
7. Literally, this term can be translated as the "point of the main (or critical) emphasis"; Clausewitz, *Vom Kriege*, 16th edition, with critical comments by Dr. Werner Hallweg (Bonn: Ferdinand Duemmlers Verlag, 1952), 874.
8. Keppler, "The Center of Gravity Concept: A Knowledge Engineering Approach To Improved Understanding and Application," 15.
9. "Schwerpunkt" HDv 100/900 VS-NfD, *Fuehrungsbegriffe (TF/B)* (Bonn: Ministry of Defense, February 1990), Sch-SEA; Other related terms include "area of the point of main decision" (*Schwerpunkttraum*), "point of main decision in an attack" (*Schwerpunkt des Angriffs*), etc. Huerth, *US-NfD. Militaerisches*

- Studienglossary Englisch*, Teil II/III, (Bonn: Bundessprachenamt, January 1993), 1060; "Schwerpunkt," Hermann Franke, editor, *Handbuch der neuzeitlichen Wehrwissenschaften*, Vol I: *Wehrpolitik und Kriegfuehrung* (Berlin/Leipzig: Verlag von Walter de Gruyter & Co, 1936), 649.
10. Collin A. Agee, *Peeling the Onion: The Iraqi Center of Gravity in Desert Storm* (Fort Leavenworth, KS: School of Advanced Military Studies, US Army Command and General Staff College, May 1992), 35.
11. Clausewitz, *On War* (1976), 596.
12. The Italian element consisted of the XXI Corps (five infantry divisions), and the Italian Armored Corps (*Ariete* armored division and *Trieste* motorized division); Myron J. Griswold, "Considerations in Identifying and Attacking the Enemy's Center of Gravity" (Fort Leavenworth, KS: School of Advanced Military Studies, US Army Command General Staff College, 14 May 1986), 10-11.
13. Thomas M. Kriwanek, *The Operational Center of Gravity* (Fort Leavenworth, KS: School of Advanced Military Studies, US Army Command and General Staff College, May 1986), 12.
14. Max G. Manwaring and Court Prisk, *A Strategic View of Insurgencies: Insights from El Salvador* (McNair Papers 4, Washington, DC: The Institute for National Strategic Studies, 1995), 18.
15. Keppler, "The Center of Gravity Concept: A Knowledge Engineering Approach To Improved Understanding and Application," 6-7.
16. William W. Mendel and Lamar Tookey, "Operational Logic: Selecting the Center of Gravity," *Military Review*, June 1993, 6.
17. *Ibid.*, 8.
18. Giles, et al., "Center of Gravity: Determination, Analysis, and Application," 17-18.
19. Michael R. Gordon and Bernard E. Trainor, *The Generals' War: The Inside Story of the Conflict in the Gulf* (Boston, MA: Little, Brown and Company, 1995), 354, 519.
20. Joint Pub 3-0, *Doctrine for Joint Operations*, III-21.
21. Stephen Clissold, Djilas, *The Progress of a Revolutionary* (New York: Universe Books, 1983), 95-96.
22. Giles, et al., "Center of Gravity: Determination, Analysis, and Application," 17.
23. *Ibid.*, 15.

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